Industrial Area Characterization and Remediation Strategy FY2000 Update

Appendix C

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Acronyms

AL	action level
AME	Actinide Migration Evaluation
ASD	Analytical Services Division
BZ	Buffer Zone
CD	compact disk
CDPHE	Colorado Department of Public Health and Environment
CPB	Closure Project Baseline
CRA	Comprehensive Risk Assessment
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
DOP	Decommissioning Operation Plan
DQO	data quality objective
EDDIE	Environmental Data Dynamic Information Exchange
EMWD	Environmental Measurement While Drilling
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ft	Feet
FY	fiscal year
GC/MS	gas chromatography/mass spectrometry
GIS	Geographic Information System
HDD	Horizontal Directional Drilling
HPGe	High Purity Germanium
HRR	Historical Release Report
IA	Industrial Area
IA Strategy	Industrial Area Characterization and Remediation Strategy
IASAP	Industrial Area Sampling and Analysis Plan
IHSS	Individual Hazardous Substance Sites
IWCP	Integrated Work Control Package
LIBS	Laser Induced Breakdown Spectroscopy
m	meter
m^2	square meter
NFA	No Further Action
NLR	no longer representative
NPWL	New Process Waste Line
OPWL	Original Process Waste Line
PA	Protected Area
PAC	Potential Area of Concern
PAM	Proposed Action Memorandum
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RSOP	RFCA Standard Operating Protocol
SNL	Sandia National Laboratory
SWD	Soil Water Database

SWWB	Site-Wide Water Balance
UBC	Under Building Contamination
VOC	volatile organic compound
XRF	X-Ray Fluorescence

1.0 INTRODUCTION

The Industrial Area (IA) Characterization and Remediation Strategy (IA Strategy) (DOE 1999a) was developed by the U.S. Department of Energy (DOE) during Fiscal Year (FY) 1999 to provide a roadmap for final closure of the Rocky Flats Environmental Technology Site (RFETS) IA and ensure full integration of remediation efforts, including facility decommissioning, characterization, remediation, and regulatory agency and stakeholder participation. This FY2000 (October 1, 1999 through September 30, 2000) IA Strategy Update describes progress on IA Strategy components and changes to the IA Strategy. This update is Appendix C to the IA Strategy.

Major accomplishments during FY2000 are data management upgrades and the draft Industrial Area Sampling and Analysis Plan (IASAP) (DOE 2000a). Key components of these two projects include the following:

Data Management

- Development of the Data Quality Filter;
- Implementation of the Data Quality Filter to create a subset of soil data for use in the IA;
- Documentation of the soil data set in the IA Data Summary Report (DOE 2000b); and
- Soil Water Database (SWD) upgrades.

IASAP

- Development of an "in-process" sampling and analysis methodology;
- Development of a hot spot methodology;
- Evaluation of IA data using SmartSampling;
- IASAP Addenda; and
- Development of a draft Comprehensive Risk Assessment (CRA) Methodology (DOE 2000c).

Other projects and programs that have an impact on IA activities, including the Soil Management Rocky Flats Cleanup Agreement (RFCA) Standard Operating Protocol (RSOP), the Annual Update to the Historical Release Report (HRR), and Decontamination and Decommissioning (D&D) interactions, are discussed in the appropriate sections.

2.0 REGULATORY FRAMEWORK

There are no updates to the IA Strategy regulatory framework.

3.0 DECISION FRAMEWORK

3.1 SITE CLOSURE

There are no updates to the Site closure strategy.

3.2 FUTURE LAND USE

During FY2000, the RFCA Parties discussed the possibility of preparing either an Interim Record of Decision or a RFCA Integrating Decision Document. Discussions will continue into FY2001. While neither document will ultimately change the Site closure strategy, they could enhance the accelerating streamlining efforts to close RFETS.

There are no changes to future land use assumptions; however, Colorado Senator Wayne Allard and Colorado Representative Mark Udall introduced joint legislation to make RFETS a National Wildlife Refuge. The proposed bill calls for 6,400 acres of the site to become a refuge after cleanup and closure is complete. At that time, the Site would be transferred to the U.S. Department of the Interior and maintained and protected as a refuge. DOE would retain any residual responsibilities for cleanup under existing environmental laws. If the proposed bill becomes law, RFCA Attachment 5, Action Level Framework may need to be modified. In addition, an onsite wildlife refuge worker exposure scenario is being developed through the risk assessment working group.

4.0 CHARACTERIZATION AND REMEDIATION APPROACH

4.1 GROUPING OF SITES

There are no updates to the grouping of sites.

4.2 INTEGRATION WITH DECOMMISSIONING

Integration with decommissioning projects during FY2000 includes the following:

- Revision of the IA characterization and remediation schedule to reflect the current 2005-working schedule. In the 2005 schedule, all characterization and remediation activities are finished by December 2006. The schedule is illustrated on Figure 1 which is a revision of the FY1999 IA Strategy Plate 3;
- Development of the Environmental Restoration (ER)/D&D interface for the Facility Disposition RSOP (DOE 2000d);

- Development of a Proposed Action Memorandum (PAM) for remediation of Under Building Contamination (UBC) at Buildings 771, 774, and 770 which has been included in the 771 Closure Project Decommissioning Operation Plan (DOP) (DOE 2000e);
- Development of the D&D/ER interface for the Building 707 DOP (DOE 2000f);
- Development of the D&D/ER interface for the Building 776/777 DOP (DOE 2000g);
- Participation in D&D Advance Planning and Characterization projects at Buildings 371, 707, and 111; and
- Assignment of ER liaisons to each of the D&D projects.

FY2000 D&D accomplishments and activities that impact IA activities include the following:

- Approval of the RSOP for Concrete Recycling (DOE 1999b);
- Demolition of Building 779, Former Weapons Research and Development Laboratory;
- Completion of the 771 Closure Project DOP;
- Completion of the 776/777 Closure Project DOP;
- Completion of the Facility Disposition RSOP; and
- Preparation of the Building 707 DOP.

D&D activities forecast for FY2001 that will have a significant impact on the IA include the following:

- Consolidation of plutonium and special nuclear material in Building 371 and the associated shrinking of the Protected Area (PA) fence. After a new fence is built around Buildings 371/374, the PA will be open for general Site access. Opening of the PA will result in easier and consequently faster access to project work sites. The existing PA fence will be removed later in the decommissioning process.
- Decommissioning of the 771/774, 776/777, 707, and 886 building clusters will be ongoing in FY2001.

4.3 RISK AND DOSE ASSESSMENT METHODOLOGY

4.3.1 Risk and Dose Assessment Methodology

A draft risk and dose assessment methodology, the draft CRA Methodology (DOE 2000c), was developed so that sampling and analysis methods planned for the IA will meet CRA requirements. This will result in the following:

- IA characterization and post-remediation sampling will be adequate for the CRA and additional sampling will not be required for the CRA.

- Analytical results (field and/or laboratory) will be of adequate quality for CRA analyses.
- Sampling density will be adequate for CRA analyses.

The draft CRA Methodology contains the following elements:

- Data aggregation;
- Contaminant of concern selection;
- Human health risk characterization;
- Exposure unit assessment; and
- Ecological risk assessment.

The draft CRA Methodology is being reviewed by the Colorado Department of Public Health and Environment (CDPHE) and the U.S. Environmental Protection Agency (EPA), and will be available on the Environmental Data Dynamic Information Exchange (EDDIE) Web Site in early 2001.

4.3.2 Comprehensive Risk Assessment

In response to the Allard/Udall proposed legislation (Section 3.1.2) an onsite wildlife refuge worker exposure scenario has been added to the draft CRA Methodology.

Actinide Migration Evaluation

The Erosion Modeling study, part of the Actinide Migration Evaluation (AME), was completed in FY2000. The project goal was to evaluate the behavior and mobility of actinides (plutonium, americium, and uranium) in surface water, groundwater, and soil. The key conclusions of the Erosion Modeling study are the following:

- Results indicate that remediation alone will not guarantee that surface water standards will always be met.
- A combination of remediation, erosion, and runoff controls, and sediment containment will be necessary to achieve surface water standards.

AME information is being used for the following purposes:

- Remediation to protect surface water;
- Remedial alternative development;
- Final Site configuration design;
- Watershed management and design; and
- Human and ecological risk assessments.

Site Water Balance

A Site-Wide Water Balance (SWWB) that will predict Site hydrology (surface water and groundwater) at Site closure was started during FY2000. Closure activities and the final end-state configuration have the potential to significantly alter groundwater, surface water, and near-surface flow at RFETS. Additionally, many Site closure decisions cannot be made without first considering quantified predictions of effects on groundwater and surface water flow. The purpose of the SWWB is to provide a management tool to evaluate how the Sitewide hydrology is likely to change from current to final Site configuration.

The SWWB will provide information for the future IA configuration to protect surface water quality, the CRA, and the final Corrective Action Decision/Record of Decision. The SWWB will also be used in predictions of surface water impacts from groundwater, current and final Site configuration, and final configurations of the Walnut Creek and Woman Creek drainages.

Several future scenarios are being evaluated in the SWWB including the following:

1. Ending the importing of offsite water onto RFETS;
2. Plugging all subsurface footing drains, storm sewers, and sanitary sewers;
3. Covering 90 acres with an engineered and vegetated surface;
4. Removing all existing roads, pavement, and buildings within and near the IA and covering with native soil and compatible vegetation, at grade; and
5. Combining scenarios 3 and 4 and adding reconfiguration of the Buffer Zone (BZ).

4.3.3 Data Quality Objectives

Data quality objectives (DQOs) for IA sampling and analysis were developed and are presented in the draft IASAP (DOE 2000a). Preliminary DQOs for the IASAP are provided in the Preliminary Data Quality Objectives for the Industrial Area Sampling and Analysis Plan (DOE 2000h).

4.4 CHARACTERIZATION APPROACH

The draft IASAP was developed during FY2000 to provide sampling and analysis methods for IA characterization and remediation sampling. The IASAP includes several innovative approaches designed to streamline and ensure consistent sampling and analysis methods. Significant components of the IASAP include the following:

- In-process sampling and analysis;
- Hot spot methodology;
- SmartSampling; and
- IASAP Addenda.

Additionally, the draft CRA Methodology was developed and will be an appendix to the Final IASAP.

In-Process Sampling and Analysis

The primary focus of the draft IASAP is the in-process sampling and analysis approach that combines statistical methods with field instrumentation analysis of soil samples. Sampling locations, based on existing data, are determined using standard statistical methods, biased sampling methods, SmartSampling, or a combination of methods. Soil is analyzed either insitu or at an onsite mobile laboratory. In-situ analysis methods include High Purity Germanium (HPGe), Laser-Induced Breakdown Spectroscopy (LIBS), or X-Ray Fluorescence (XRF) techniques. Organic compound analysis methods consist of gas chromatography/mass spectrometry (GC/MS).

These methods will result in the following:

- Real-time determination of where contamination exists above background or RFCA action levels (ALs);
- Real-time remedial decisions (i.e., whether remediation is required); and
- Real-time determination whether remediation goals have been met.

Hot Spot Methodology

A hot spot methodology specific to Individual Hazardous Substance Sites (IHSSs), Potential Areas of Concern (PACs), UBC Sites, and IA White Space Areas was developed to augment statistical sampling location and traditional data analysis methods. The size of a hot spot will define the sampling location grid.

The hot spot size for IHSSs, PACs, and UBC sites is 11 meters (m) (36 feet [ft]) in diameter. This corresponds to the field of view for the HPGe and provides for radionuclide analysis of 90 percent of IHSSs, PACs, and UBC Sites.

The hot spot size outside of IHSSs, PACs, and UBC Sites (White Space Areas) is 10,000 square meters (m^2). A 10,000 m^2 hot spot is small in comparison and results in conservative sampling location grids for this large area.

SmartSampling

SmartSampling is a geostatistical approach that combines several statistical software packages to determine sampling and remediation locations. SmartSampling was developed at Sandia National Laboratory (SNL) and is currently used at several DOE sites.

The use of SmartSampling in the IA will accomplish the following:

- Optimize the number and locations of characterization samples;

- Develop maps of the areas requiring remediation at a given level of probability;
- Optimize the number and location of confirmation samples;
- Achieve DQO-specified limits on decision errors; and
- Link onsite analysis with sampling to allow near real-time remediation decisions (i.e., determine whether remediation is required).

SmartSampling is an iterative process based on remediating the site to required ALs at a specified level of confidence. SmartSampling will use existing and IA-generated data to map the probability of exceeding RFCA ALs in IHSSs, PACs, UBC Sites, and White Space Areas.

IASAP Addenda

The IA consists of 194 IHSSs, PACs, UBC Sites and tanks that were consolidated into 58 IA Groups (DOE 1999a) to streamline decision document efforts and coordinate with the D&D schedule. To further streamline the decision document process, IASAP Addenda that will contain IA Group-specific sampling and analysis requirements will supplement the IASAP. This will eliminate the need for developing separate sampling and analysis plans for each IA Group. The draft IASAP Addendum for IA Group 700-4 is included as an example of an IASAP Addendum as Appendix A to the draft IASAP.

CDPHE and EPA are reviewing the draft IASAP. The final IASAP will be available in early 2001 on the EDDIE Web Site.

4.5 REMEDIATION APPROACH

4.5.1 No Further Action

CDPHE and EPA provided comments on the 1997, 1998, and 1999 HRR Annual Updates. These comments were addressed in a response to the regulatory agencies and the data are incorporated in the 2000 Annual Update to the HRR (DOE 2000i). To date, 94 sites have been accepted as No Further Action (NFA) recommended sites, 174 require additional characterization, and DOE will provide additional data on 63 sites.

4.5.2 Removal and Offsite Disposition

There are no updates to the removal and offsite disposition strategy.

4.5.3 Caps and Covers

The proposed 700 Area Cap has been removed from the Closure Project Baseline (CPB). Reevaluation of existing historical data indicates remediation of the 700 Area will provide the appropriate level of protection for human health and surface water resources. Costs for remediating IHSSs, PACs, and UBC Sites in the 700 Area are in the current CPB.

4.5.4 Plume Remediation

The groundwater plume map that illustrates the extent of volatile organic compound (VOC) and nitrate plumes in the IA has been revised and is presented in the 1999 Annual RFCA Groundwater Monitoring Report (DOE 2000j).

4.5.5 Groundwater and Surface Water

Updates to groundwater and surface water are discussed in Section 4.3.3.

4.5.6 Decision Documents

An RSOP for Soil Management is being developed to combine existing discrepant soil management activities into one process to ensure consistency and protection of human health and the environment. This RSOP contains a decision tree for appropriate soil management options based on RFCA Tier I and Tier II values. Site personnel will follow this RSOP regardless of whether the soil was disturbed for maintenance, construction, characterization, or other Site activities. Once approved, the RSOP will replace the existing FO.23 and FO.29 Site procedures and ensure appropriate soil management in support of closure.

4.6 CHARACTERIZATION AND REMEDIATION CHALLENGES

4.6.1 Underground Pipeline Systems

Original Process Waste Lines (OPWL), New Process Waste Lines (NPWL), Sanitary Sewer System, and Storm Drains exist within and outside of existing IHSSs, PACs, and UBC Sites. Pipelines within or close to IHSS, PAC, or UBC Site boundaries will be included in the area of concern for characterization. OPWL will be characterized and remediated according to the current CPB, but Resource Conservation and Recovery Act (RCRA) closure of the OPWL will take place after appropriate characterization and remediation.

Existing OPWL data were compiled onto a map that illustrates documented OPWL leaks. This map is included as Figures 22 and 25A through 25F in the draft IASAP (DOE 2000a).

4.6.2 Under Building Contamination

Two UBC sites, UBC 123 and UBC 886, are being investigated during FY2000 and FY2001. An innovative technique using horizontal directional drilling (HDD) coupled with the Environmental-Measurement-While-Drilling (EMWD) is being used to evaluate potential contamination beneath the UBC Sites. HDD is a technology that drills horizontal boreholes. EMWD is a gamma measurement instrument that monitors radionuclides in a borehole. This project also includes drilling through floor slabs using conventional techniques.

HDD and EMWD techniques will be compared to conventional techniques to determine the following:

- Whether HDD/EMWD are effective in characterizing soil under active buildings;
- Whether HDD/EMWD are effective in characterizing soil around OPWL and other underground utilities; and
- Whether HDD/EMWD provide health and safety, cost, or schedule benefits.

Field work is scheduled for October 2000. Results will be available in early 2001.

4.7 DATA MANAGEMENT

4.7.1 Existing Data

Existing IA data were evaluated to determine their applicability to IA sampling and analysis activities. Because most FY2000 work is applicable to existing and new data, data management activities are described in Section 4.7.4, Data Management Challenges.

4.7.2 Comprehensive Data Compilation

A compilation of existing IA data is presented in the IA Data Summary Report (DOE 2000b) and Appendix B of the draft IASAP (DOE 2000a).

4.7.3 New Data

New data collected during IA characterization and remediation activities will consist of field analytical and laboratory analytical data. Field analytical data generated during IA sampling activities will be managed so that data are easily configured and transferred to the appropriate Site databases. All field instrumentation will be equipped with instrument-specific software that will record and report all relevant environmental and quality control data generated. Field measurements will be downloaded daily, or at the end of the sampling event if it is less than 1 day. A field data system will stream data from the analytical instruments into a relational Microsoft Access database. Data will be configured for the following uses:

- ER data evaluation according to DQOs;
- SmartSampling;
- Analytical Services Toolkit; and
- SWD.

Offsite laboratory analytical data will be managed in accordance with current Analytical Services Division (ASD) procedures.

4.7.4 Data Management Challenges

Effective management of environmental data is critical to the success of the IA Closure. Quality data is required for remedial decisions and for use in the CRA. Because much of the existing data in the IA have not been evaluated according to RFETS quality assurance requirements nor presented to the regulatory agencies, this was an important task in preparing for Site closure. Several data management tasks were completed during FY2000.

Data Quality Filter

A Data Quality Filter was developed to evaluate all data sets used for IA decisions. The IA Data Quality Filter was used with existing SWD to develop a set of data that is the starting point for IA characterization planning. Additionally, all data developed during IA characterization and post-remediation sampling activities will be processed through the filter. This process will result in a CRA data set. Records in SWD will be marked with the appropriate qualifiers to identify IA and CRA data.

The Data Quality Filter provides a step-by-step process for evaluating the quality of environmental data. Key components of the filter include the following:

- Evaluate data to determine whether the data meet documented laboratory procedures and analyses were conducted according to standard laboratory procedures;
- Evaluate data to determine whether the data meet laboratory validation and verification guidelines;
- If data have not met all the quality criteria, evaluate data uses to determine whether data are qualified for limited use;
- Evaluate data against field procedures and work plans to determine whether data were collected correctly;
- Evaluate data to determine whether locations have been remediated and are no longer representative of Site conditions; and
- Evaluate data to determine whether there are limitations on the data due to regulatory or user concerns.

These specific criteria are itemized and systematically evaluated through research and database queries and the data are individually "flagged," by record, in the digital data sets used to support IA activities.

Further details on the Data Quality Filter are in the Preliminary DQOs for the IASAP (DOE 2000h) and the Draft IASAP (DOE 2000a).

Implementation of the Data Quality Filter to Create the Soil Data Set

The Data Quality Filter was implemented by developing a set of database queries that systematically evaluated each record against the Data Quality Filter criteria. The results

of these analyses are presented in the IA Data Summary Report (DOE 2000b) and briefly described below.

Industrial Area Data Summary Report

The IA Data Summary Report is a compilation of existing surface and subsurface soil data in the IA. Data from the SWD were evaluated through the Data Quality Filter and against additional IA-specific criteria to develop a data set of usable quality data.

Approximately 1 million analytical records within the IA boundary were evaluated through the filter including 136,608 subsurface soil and 68,893 surface soil records. Fifty-nine percent of the subsurface soil records are usable without qualification, 15 percent were rejected, and the remaining records are usable with qualification. Fifty-two percent of the surface soil records are usable without qualification, two percent were rejected, and the remaining records are usable with qualification.

The IA Data Summary Report contains maps of all IHSSs, PACs, and UBC Sites in the IA that have existing data with the locations and types of data available. The complete data set, including location, analytical data, and qualifiers are included on a compact disk (CD). The Industrial Area Data Summary Report is available on the EDDIE Web Site.

Soil Water Database

Several tasks that improved data quality and accommodated the needs of IA characterization and remediation and eventual CRA analysis were completed by the cooperative efforts of the ER and Environmental Systems and Stewardship Groups. These accomplishments include the following:

1. Standard Query Tool - Developed a standard query tool so that users can transfer data out of SWD and into database or spreadsheet programs. Retrieving SWD data no longer requires programming skill.

2. Corrected and Correlated Location Data - Reviewed sampling locations to ensure consistency between SWD and the Site Geographic Information System (GIS) including:
   - Reviewed and updated 1,125 borehole locations; and
   - Reviewed and updated 1,234 well locations.

3. Missing Field Data - Added Missing Field Data for environmental sampling projects (especially those associated with the IA) to link location code to electronic analytical data.

4. Created Master Location Table - Created a link between SWD and GIS to store sampling locations for spatial analysis. This new table provides a single source of quality control-reviewed environmental data locations for RFETS. The table will significantly help users find and map data.

5. Coded Data by Logical Groups - Added codes to SWD for project names, IHSS, PAC, UBC Site and other common designations to help users find data fast.

6. Fixed Pick-Lists –Reviewed and edited project name and sample type pick lists for better data coding and sorting.

7. Added NLR (No Longer Representative) Field - Allows projects to code data that are "no longer representative" of site conditions (i.e., waste shipped offsite or soil removed).

8. Fixed Soil and Surface Water Locations - Reviewed and corrected 3,000 surface soil and surface water sampling locations.

9. Delete Tool – Created a tool to allow SWD administrators to remove duplicate data resulting from laboratory issues.

10. Location Control and Surveying Procedure – Developed a new procedure for location control and surveying.

5.0 PROJECT INTERFACES

5.1 HEALTH AND SAFETY

The Integrated Work Control Package (IWCP) process is being evaluated and revised to be more effective. The new IWCP process is expected to reduce redundancy while focusing efforts on health and safety improvements. Key features of the IWCP revision include new requirements for lockout/tagout and increased use of preventative maintenance and standard operating procedures.

5.2 WASTE MANAGEMENT PROGRAM

There are no updates to the Waste Management Program.

5.3 ANALYTICAL SERVICES DIVISION

ER staff will use field analytical instruments for characterization and remediation sample analyses in the IA in addition to ASD offsite laboratory capabilities. ER and ASD will interface throughout FY2001 on several issues that will affect IA characterization activities as follows:

- Quality assurance for field analytical instruments;
- Data management; and
- Offsite analytical laboratory use.

5.4 PROCUREMENT

ER staff is formulating characterization and remediation procurement strategies. The ER procurement strategy includes obtaining the following services:

- IA field sampling;
- IA field analytical capabilities; and
- IA remediation.

5.5 RESOURCE STRATEGIES

As part of the new Kaiser-Hill Company, L.L.C. contract with DOE, many Site functions were reorganized to focus on project-oriented goals. The reorganization will enhance communication between and among projects and help focus on Sitewide closure issues.

5.6 PROJECT COMMUNICATION

ER staff communicate with a variety of Site organizations on both ongoing and as-needed bases. ER interaction with the D&D organization is described in Section 4.2.

6.0 REFERENCES

DOE, 1999a, Industrial Area Characterization and Remediation Strategy, September.

DOE, 1999b, RFCA Standard Operating Protocol – Concrete Recycling, September.

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DOE, 2000i, Historical Release Report, September.

DOE, 2000j, RFCA Groundwater Monitoring Report, September.

Figure 1 – Industrial Area Schedule